Title: Quantifying the Benefits of the Low-Income Housing Tax Credit Program to Recipient Households: A Market Based Approach

Author Name:	**Author Affiliation:**
Gregory S. Burge	**Assistant Professor** **Economic Department** **University of Oklahoma, Norman Oklahoma**
Author Telephone Number:	**(850)980-0162**

Date of Manuscript: **September 20th, 2007**

Quantifying the Benefits of the Low-Income Housing Tax Credit Program to Recipient Households: A Market Based Approach

Gregory Burge
University of Oklahoma

Abstract

The literature concerning the merits of supply-side builder subsidy programs is extended by comparing the magnitudes of low-income housing tax credit (LIHTC) subsidies to the rent savings they generate for low-income households in a medium sized MSA. Quantifying this savings requires a detailed understanding of the determinants of market based apartment rents combined with knowledge of the HUD imposed price constraint faced by LIHTC complexes. Using market specific pricing parameters taken from the results of hedonic rent decompositions for the selected housing market, I compare the maximum rents allowed under the LIHTC program to predicted market rents for similar units and argue the difference represents an upper bound estimate of the savings in rent to the recipient household. The stream of rent savings over the life-cycle of investigated projects is found to be much smaller than the cost of the tax credits. My findings support the idea that the LIHTC program's unintended impacts may include placing marginally qualifying low-income renters in newer (but not cheaper) housing units and providing large real gains to project developers and investors.

Keywords
Affordability, Rental Housing, LIHTC Program, Subsidies

Introduction

For more than two decades the Low-Income Housing Tax Credit (LIHTC) program has been a source of controversy. The program addresses shortfalls in the availability and affordability of rental housing for low and moderate income households in the U.S. The program can be considered successful on several levels. Since its inception as a part of the Tax Reform Act of 1986, over 1.5 million rental housing units have been built under the program nationwide and it has become the primary source of project based federal aid.[1] Roughly 125,000 new units are developed under the program on an annual basis, with no signs of slowing. LIHTC subsidized projects house a considerable portion of all low-income renting families in urban, suburban, and rural communities.[2] Furthermore, recent (unsuccessful as of yet) proposals in Congress have sought to double the size of the program.[3]

However, at a cost to taxpayers of over 5 billion dollars annually, the efficiency and effectiveness of the LIHTC program, particularly relative to tenant based vouchers, have been questioned by Stegman (1991), Case (1991), Nelson (1994), Olsen (2000), and McClure (2000) among others. The potential beneficiaries of the program are numerous: project developers, ownership deal syndicators, private investors and low income households (the intended benefit group). Rather than attempting to quantify the program's benefits to each of these diverse interests groups, I follow a traditional

[1] See the website of the Danter Company (http://www.Danter.com) for data tables showing overall levels of LIHTC construction through 2005, including breakdowns by state.
[2] For a complete listing of all LIHTC sponsored projects see the webpage http://lihtc.huduser.org/.
[3] Submitted by Rep. William Jefferson (D-LA), May 26th, 2005. H.R. 2681, 109th Congress, 1st session.

approach that focuses on the benefits to low income renting households, the primary target of the program.

Quantifying the benefits of the LIHTC program to low income families is complicated. Benefits may come from three potential sources. First, the program may lead to increased low income housing production, shifting the supply curve forward and pushing down competitive rental housing prices. Second, by giving state and local governments the authority to allocate awards to those projects that they feel best serve the needs of low income residents, LIHTC projects may be better matched to neighborhoods providing increased access to public services and social networks to low income families. Third, LIHTC subsidized units may cost low income households less to rent than comparable units that were developed privately. While the literature has addressed the first and second potential sources of benefit, scant attention has been given to the third. This paper addresses this gap by investigating the simple question: How does the savings in rent that accrues to low income tenants over the lifecycle of a typical LIHTC project compare to the cost of the project's subsidy to taxpayers? I carry out this exercise for three recent LIHTC projects undertaken in the Tallahassee, FL. MSA.

An essential aspect of the analysis is the estimation of private market rents that would have otherwise been obtainable for the LIHTC developed units in the absence of LIHTC participation. The results suggest that the LIHTC program benefits a relatively small number of qualifying households for a relatively short period of time. The primary effect is found to be placing LIHTC residents into newer (as opposed to larger or more

conveniently located) units. The findings show that as LIHTC complexes age, they quickly find HUD's annually determined affordable rents to be less and less of a binding constraint. I argue this outcome compares unfavorably to the benefits of demand-side voucher programs, and that future rental housing subsidy programs should reflect a better understanding of the dynamic nature of rental housing prices as complexes age.

Literature Review

Overview of the LIHTC Program

The LIHTC program has played a central role in debates concerning affordable rental housing policies over the past two decades. In fact, it has been the primary federal policy used in attempts to boost the production of affordable rental housing since it was created by the Tax Reform Act of 1986 (Cummings and DiPasquale, 1999). Qualified developers are selected by state administrative agencies through a competitive process and are awarded a 10-year stream of tax credits (that begin only after the proposed development is completed). Typically, project developers sell the tax credits immediately to acquire up front capital that is applied to construction costs, thereby reducing the size of the mortgage held on the property. This is usually accomplished by forming a limited partnership that investors buy into with up-front cash payments in return for shares of ownership of the project (and, in turn, its future tax credits). The size

of the tax credits follows a predetermined formula that only includes qualifying costs.[4] In return, project owners make a long term commitment that units developed under the LIHTC subsidy will be occupied by low to moderate income households and that their rents will meet HUD's annually determined affordability standards. Affordability standards are specific to individual housing markets and are set each year such that a marginally qualifying household (i.e., a family earning 60 percent of area median income adjusted to their family size) would pay only 30 percent of their income towards rent. It is worth noting that rent standards *do not depend on individual household characteristics* of participant renters. Hence, households making less than 60 percent of adjusted area median income are forced to devote more than 30 percent of their annual income to rent. Annual tax credits are roughly 9 percent of qualifying depreciable construction costs for new projects or about 4 percent for existing property acquisition costs. (McClure, 2000)

Housing Production Effects

While no less than 1.5 million units have been constructed under the LIHTC program since its inception, this does not reflect the actual *effect* the program has had on the production of affordable units. The "crowding out" phenomenon (i.e., the possibility that LIHTC units are simply replacing units that would otherwise have been built under private financing) is investigated by Malpezzi and Vandell (2002), Sinai and Waldfogel (2005), Baum-Snow and Marion (2007), and Eriksen and Rosenthal (2007). Malpezzi and Vandell construct cross sectional models that include a number of supply and

[4] Non-depreciable costs such as land acquisition, for example, do not qualify. Also, project managers may voluntarily decide to reduce their requested subsidy below what the formula would allow in efforts to increase the likelihood of their proposal being accepted.

demand shifters, to estimate the effect that the number of LIHTC constructed units has on the overall housing stock. They find no significant relationship between the number of LIHTC units (and other subsidized units) built in a given state and the size of the current housing stock in that state. This suggests an extremely high rate of substitution (implying full crowding out) between LIHTC funded developments and private developments. However, while Malpezzi and Vandell are not able to reject the null hypothesis that there is one-for-one substitution, they point out that the presence of large standard errors in their estimations makes it difficult to draw firm conclusions. They are also not able to comment directly on whether or not the LIHTC program influences the composition of the housing stock since their measure is housing stock per 1000 population.

Sinai and Waldfogel (2005) investigate whether places with more public and subsidized housing have more total housing, after controlling for housing demand. They find that for supply-side subsidy programs, such as the LIHTC program, government-subsidized units do increase the total number of housing units, but that on average only one out of every three units built is an actual increase to the housing stock (i.e., two out of every three subsidized units simply replace a unit that would have otherwise been provided by the private market). On the other hand, they find tenant-based assistance programs to have a much stronger effect, increasing the stock by nearing two-thirds of a unit per one additional tenant-based subsidy. Baum-Snow and Marion (2007) find that for every LIHTC unit built, the stock of rental housing increases by approximately 0.23 units within a 1 km. concentric ring around the development, but that this effect dissipates to zero (i.e., full crowding out) as the considered area becomes larger. They also report

LIHTC construction has no effect on the stock of owner occupied housing. Eriksen and Rosenthal (2007) find that within a ten-mile area, one-third of LIHTC development is offset by a crowd out of private construction, suggesting a somewhat larger overall effect of the program on the stock of rental housing than other investigations. Collectively, these investigations provide evidence that the LIHTC program does increase the stock of rental housing, but by relatively small amounts compared to the number of units that have been constructed under the program, due to high levels of crowding out.

Neighborhood Quality Effects

A second important potential source of benefit from the LIHTC program is that local governments may purposefully approve LIHTC proposals that are to be built in areas that provide enhanced neighborhood quality and access to public services. Using data from over 2,500 LIHTC projects Cummings and DiPasquale (1999) find that the program is most frequently used to provide additional rental housing opportunities in already poor neighborhoods rather than generating affordable units in higher income areas. Newman and Schnare (1997) find that federal assistance programs including the LIHTC do a poor job of improving recipients' neighborhood quality relative to welfare households, while voucher programs did reduce the likelihood recipients' would live in the worst areas. Collectively, these findings suggest there is little, if any, improvement of neighborhood quality for low income households associated with the LIHTC program.

Efficiency and Relative Effectiveness

McClure (2000) documents that mixed-income housing is rarely developed under the LIHTC program. Instead, developers typically devote 100 percent of their proposed units towards the subsidy program, a troublesome fact in light of the initially stated goals of the program. Most researchers have argued that supply side subsidy programs are strictly less efficient and more costly (to confer the same benefit) than housing vouchers. Echoing the criticism that the LIHTC program better serves moderate income households than it serves poor households, Stegman (1991) contends:

> "It simply doesn't make sense to have a national housing policy in which the deeper the targeting and the lower the income group served, the more complicated and costly it is to arrange the financing."

This conclusion in supported by the fact that a majority of those served by the LIHTC program earn incomes at or near the qualification threshold (i.e., at or below 60 percent of area median income but above 50 percent) rather than helping the poorest families (Nelson, 1994).

Olsen (2000) concludes that empirical estimates uniformly show tenant based programs to deliver housing (of any quality level) at much lower costs than project based programs. He argues that the efficiency gains associated with reallocating all federal funding currently going to project based programs (of which the LIHTC is by far the largest), would allow several million additional families who are below the poverty line to be served, without lowering the benefits to anyone currently receiving assistance. McClure (1998) finds the cost premium (defined as the extra funding that would be required to

deliver the same level of housing services to recipients) associated with project based programs to be approximately 40 percent. Although this is lower than previous estimates that were in the range of 50 to 100 percent, tenant based programs have consistently been shown to deliver similar levels of assistance to poor families at lower costs to taxpayers than project based programs such as the LIHTC.

Case (1991) argues one of the biggest problems plaguing the LIHTC program is the unavoidable inefficiency created by the difference in the rate of return required by private investors in LIHTC projects and the federal government's long-term cost of financing debt. He finds that, possibly due to high levels of uncertainty and risk present early in the program's history, private investors in LIHTC projects required somewhere in the range of 16 percent as their rate of return, at a time when the government's cost of financing credit was in the range of 7 to 8 percent. He also contends that the significant competition amongst developers to obtain LIHTC participation reveals that at least a portion of the real benefits of the LIHTC program are conferred upon project developers.

To summarize, my review finds widespread agreement on the extent to which the LIHTC program produces the first and second types of potential benefits to low income households outlined in the introduction. Concerning a potential stimulation in the production of low-income housing, the empirical evidence suggests crowding out is occurring, perhaps even at very high levels. Estimates range from a one-third rate of substitution to full crowding out; implying it would be difficult to argue the program is worth its large social cost based on increased availability of affordable rental housing

alone. In regards to the possibility that LIHTC projects may bring low income households improved access to neighborhood quality, several investigations discussed above reveal this is simply not the case. However, even if there is a lack of benefits coming from these two potential sources, there is still the possibility that the LIHTC program may be an effective tool to lower actual rents, making housing more affordable for recipient households. While this issue is central to the debate concerning the effectiveness of the LIHTC program, it has not been directly investigated in the literature. The present analysis seeks to fill that gap.

Empirical Approach

This paper estimates the difference between HUD mandated affordable rents over the life-cycle of three LIHTC projects in a selected MSA and the predicted market rents those units would otherwise have been able to obtain on the open rental housing market during the same time period. I conceptualize this difference as an upper bound on the personal benefit to low income households who rent units subsidized under the program.[5] Following a traditional approach, apartment rents are explained using hedonic regression techniques.[6] The empirical model is summarized by:

[5] Two factors support this conjecture. First, it is likely that some aspects of unit and complex quality are unobservable. Intuition suggests that, because developers of LIHTC projects know they will face a binding pricing constraint, subsidized units are likely to be built with lower levels of quality in regards to these missing variables than are privately developed units. Second, the effect of age on complex rent may be sensitive to the level of expenditures on upkeep and maintenance. Again, because a potentially binding price constraint is in place for LIHTC units, intuition suggests they would spend less on maintenance and upkeep that other complexes. Lower levels of upkeep would suggest a more rapid decline in obtainable market rents.

[6] The hedonic pricing approach comes from Lancaster (1971) and Rosen (1974). It assumes apartment rents are determined by a bundle of measurable attributes associated with the unit. For a more detailed discussion of the hedonic pricing approach, see Burge (2007).

$$R_{ij} = f(U_i, C_j, A_j, N_j, L_j, P_j) \quad (1)$$

where R_{ij}, U_i, C_j, A_j, and N_j, represent monthly rent, physical attributes of the unit and complex, location, and neighborhood quality respectively. These factors are most commonly identified within the literature as important determinants of rent. L_j is a vector of contractual variables describing the leasing arrangement for complex j and P_j are variables reflecting the level of public service provision to complex j.

The hedonic estimation of (1) is taken from Burge (2007). This investigation uses data from privately developed (i.e., non-LIHTC subsidized) complexes to investigate the determinants of market rent for the Tallahassee, FL housing market. Table 1 presents the descriptive statistics of the data.[7] Observations fall into one of eleven different "unit types".[8] The 130 apartment complexes found in the data contribute 381 observations, 15 of which come from one of the six LIHTC subsidized complexes and were not included in the hedonic regressions estimated in that work. Using the regression estimates from that paper (later reported as Table 2) as a starting point, the present exercise takes the estimated pricing characteristic coefficients and applies them to the observed characteristics of the LIHTC subsidized units in the Tallahassee MSA, such that predicted market rents for all LIHTC units (by year) are obtained. The procedure, which is later described in more detail, accounts for the role of time and allows for the difference between LIHTC mandated affordable rents and predicted market rents to vary as the property ages. Of interest is the magnitude of the present value (at the time of

[7] See Burge (2007) for a more complete description of the data used to construct the hedonic pricing equations presented in that work and used for the present analysis.

[8] For example, if one complex has two-bedroom/one-bathroom units as well as two-bedroom/two-bathroom units, each renting for a different amount, this complex contributes two distinct observations, each sharing the same complex level variables but differing in unit specific variables.

LIHTC project approval) of two streams: the forgone tax revenue associated with the allocated tax credits and the savings in rent that accrue to low income households.

Hedonic Pricing Regression Results

Table 2 reports the findings of four hedonic regression models that are taken from Burge (2007). [Insert Table 2 about here] Models 2 and 4 represent the full specification of equation (1) and include measures of neighborhood quality. Models 1 and 3 are a partial specification of equation (1) that omits the neighborhood quality variables. Models 1 and 2 are linear OLS models while models 3 and 4 are semilog form. While the explanatory power is high in all four estimations, the pricing parameters used in the present application are taken from Model 1.[9] While it is beyond the scope of this paper to discuss the hedonic regression results in great detail, it is worth mention that over ninety percent of the variation in market rents is explained by Model 1 and that nearly all of the structural control variables coefficients are highly significant, all with the anticipated sign.[10] This suggests it is reasonable to use the estimated pricing parameters for the purpose of predicting otherwise obtainable market rents for LIHTC subsidized units.

Of particular relevance to my analysis is the manner in which aging exerts a negative pressure on market rent. The relationship between property age and predicted market rent is summarized by Figure 1. [Insert Figure 1 about here] The estimated parameters

[9] Models 1 and 2 have the highest explanatory power, with nearly identical adjusted R^2. Model 1 is selected since it does not include the several insignificant neighborhood quality variables present in Model 2. The qualitative results of the LIHTC program evaluation are highly robust across the selection of any of these 4 models.

[10] See Burge (2007) for a discussion of the hedonic regression results.

suggest that market rents fall quickly as apartment complexes age initially, reflecting a significant newness premium. The negative effect, however, slows down considerably over time. For example, otherwise identical units would differ in rent by over $105 on average if one was new and the other was ten years old. The estimated difference in rent between twenty and thirty year old units drops to only $36.[11] It is important to note that HUD's annual affordability guidelines make no adjustments based on the age of the complex: whereas private rents may carry a newness premium, HUD's allowable rents do not. This implies the difference between the two (the rent savings) should initially be the greatest, and then dissipate (potentially to zero) over the life-cycle of the project.

LIHTC Program Evaluation

While previous investigations of the LIHTC have addressed several important questions concerning the LIHTC (see Section II), there have been no systematic efforts to quantify the actual magnitude of the "benefit" to low income households who eventually rent units that were subsidized under the program. An intuitive definition of this particular type of benefit is the difference between what renting households pay under HUD's affordability guidelines and what the unit would otherwise rent for on the open market.[12] The hedonic regression results taken from Burge (2007) were constructed using only observations from non-subsidized apartment complexes. However, the estimated pricing parameters,

[11] Intuition also suggests the relationship between age and rent would be subject to expenditures on property maintenance and repair at the individual complex level. Future work should investigate the relationship between maintenance/repair expenditures and rents for both privately developed and subsidized complexes.

[12] It should be noted that many residents of LIHTC subsidized units *also* receive some sort of household based assistance. However, the costs and benefits of other forms of assistance are not the focus of the present investigation.

along with the complete set of observed independent variables for LIHTC subsidized complexes that is used for this application, can be used to predict otherwise obtainable market rents for LIHTC units and, in turn, to quantify the rent savings that can be attributed to the program.

Recall that each LIHTC complex is given a substantial tax credit that is allocated over a 10 year period following completion of the project. The annual tax credits are roughly 9 percent of the total project cost for new construction and 4 percent annually for the cost of acquisition of existing structures.[13] The full discounted present value of the forgone tax revenue provides an accurate measure of the social cost of the project. In return, owners of each complex make a long-term commitment to rent their units to households making sixty percent or less of the area median income, charging only rents that meet HUD's annual affordability criteria.[14] HUD's maximum affordable rents are set using the following procedure:

1. HUD determines the annual median family income for a given area. The 2002 figure for the Tallahassee MSA is $57,200.
2. 60 percent of this amount determines the cutoff for a typically sized marginally qualifying low-income family. This amount is multiplied by 30 percent (the implied affordability benchmark) and divided by 12 to determine the base value for the maximum allowable rent.
3. This base value is adjusted for unit size: 75 percent for one bedroom units, 90 percent for two bedroom units, and 104 percent for three bedroom units.

[13] Of the six LIHTC complexes in the data, three fell into each category.
[14] It is worth noting that a considerable amount of uncertainty over future criteria is likely present at the time of LIHTC application.

The present analysis defines the difference between this capped amount for a given year and the predicted rent for the same unit on the free market as the benefit (rent savings) to that household. The results of the hedonic pricing equation, along with the data from LIHTC units, allow for the computation of predicted market rent, specific to year 2002, for each subsidized unit. Predicted market rents are then compared to HUD's maximum allowable 2002 rents, to see where (and to what extent) the price constraint binds. The third column of Table 3 [Table 3 about here] reports the unit size adjusted HUD allowed rent for each of the fifteen LIHTC observations. The fourth column shows the predicted markets rents for 2002 for each observation. The intuition is straightforward, to the extent that predicted rents exceed allowed rents, residents' benefit from the program.

Based on the predicted year 2002 market rents, twelve out of the fifteen LIHTC observations have non-binding limits. That is to say, predicted market rents fall at or below the allowed rent for the unit. In the three other cases, project owners could charge within ten dollars of market rent. Hence, by 2002, the pricing constraint for these projects seems to be largely non-binding- owners can essentially charge the estimated full market rent. However, this limited snapshot yields misleading conclusions. Obtainable market rent declines over the life-cycle of an LIHTC project, while the rent cap is unaffected by the age of the unit. The most obvious reason the predicted market rent for the LIHTC units are either below or near the maximum allowable rent is that each project was at least five years old by 2002. The fourth column of Table 3 provides the predicted 2002 market rent following a hypothetical prediction that supposes *the units are in their first year of operation*. In every case the LIHTC rent cap now binds, with the allowed

rent generally five to ten percent lower than market rents. Therefore, the results suggest that project owners do face initially binding pricing constraints (and, in turn, residents initially receive significant rent savings), but that this constraint rapidly dissipates as the project ages and allowable rents begin to approach, and eventually fall below, what the units could otherwise command on the open market. Thus, the pricing dynamics of rental housing with respect to project age are particularly important when estimating the overall rent savings to low income households.

Although there are admittedly other possible sources of benefit from the LIHTC program that fall outside of the scope of this paper, it is interesting to compare the social cost of the LIHTC subsidies to the magnitude of household's rent savings over the projects' life-cycle for the three complexes in the data where developers received federal aid for new construction. The social costs of LIHTC program come from the ten year stream of the tax-credits allocated to the project owner. In each case, this stream of credits is turned into a present value using the federal discount rate at the time of allocation.[15]

The benefits of the LIHTC program reflect the rent savings that accrues to participant households for each complex and are estimated as follows:

1. Using the estimated coefficients from model 1, predicted 2002 market rents (reported in Table 3) are computed for each observation. For every other year of the projects existence, predicted rents still make use of the estimated hedonic pricing parameters but are recomputed after adjusting the age so the predicted rent

[15] Five percent was selected as the discount rate and is also used as the discount rate for adjusting yearly benefits from step 6.

is for a unit of the correct vintage. Table 4 reports the details of these calculations for a selected observation. [Insert Table 4 about here] Since the complex was 8 years old in 2002, 6 years was entered when calculating 2000 rents, and so on. Predicted rents for units of varying age are reported in column 3.

2. Since all predicted values are in 2002 dollars, these figures must be adjusted to reflect market price conditions that prevailed in earlier years. Using rental housing cost indexes coming from the US Statistical Abstract, these figures are adjusted for each year of the project.[16] Index multipliers are reported in the fourth column of Table 4 and the fifth column reports adjusted predicted rents.
3. Maximum allowed rent for each unit (by year) was obtained following the process employed by HUD when determining maximum affordable rents as described in the text, after obtaining the HUD reported area median income for each year. This step also accounts for adjustments to the base rate depending on unit size.
4. The difference between the adjusted predicted market rent and maximum allowable rent is defined as the rent savings (benefit) per unit, per month. This is multiplied by 12 to obtain the rent savings associated with the unit for the full year. Where the predicted market rent falls below the maximum allowed rent, the rent savings is taken to be zero.
5. This figure is multiplied by the number of units of that type in the complex.
6. Aggregate yearly benefits totals for each complex are turned into present values at the time of the initial year of operation (also the first year of credits) and summed.

[16] National rental housing costs indices are used. Further adjustment of this index using Tallahassee MSA specific adjustment weights is possible but this series was found to be highly unstable over time. The index value for Tallahassee rises and then falls again by nearly 20 percent in just a few years, a highly implausible result.

7. Finally, the two discounted present values are compared as described in the text.

For the three non construction complexes, this exercise produces:

	PV: forgone tax revenue	PV: rent savings
Complex 1	$6,120,961	$547,449
Complex 2	$6,175,267	$1,004,977
Complex 3	$4,086,633	$545,362
Totals	$16,382,861	$2,097,788

Thus, the rent savings is only ten to fifteen percent as large as the magnitude of the costs in all three cases, a disturbing result.

Again, to be fair, there are other potential benefits of the LIHTC program that I have not investigated. The possibility that the LIHTC program significantly enhanced the availability of affordable rental units and/or that the development of LIHTC projects helped to hold down free market rental housing prices in the selected MSA must be recognized. The presented exercise attempts to quantify only one important aspect of the social benefits of the LIHTC program that has not been previously investigated.

Also, to the extent that foregone revenues exceed the savings that accrues to low-income households, it is incorrect to characterize the difference as a pure loss. My analysis is not able to comment directly on the magnitude of benefits from the LIHTC program that accrue to developers or project investors, but the large gap between rent savings and the size of the subsidy suggests they are considerable. In fact, my results lead to the conjecture that the real winners from the LIHTC program seem to be those developers fortunate enough to be awarded the tax credits, and that the program only benefits low

income families to a smaller extent. Hence, the LIHTC program may act more as a wealth transfer to recipient developers and project owners than to low income families.

Furthermore, a closer examination of the "benefits" that accrue to low income households is merited. Since program rent controls are only found to bind in these cases for the first five to seven years, the 'benefit' of the LIHTC program stems from a relatively small number of moderately low-income families paying below market rents for only the first few years of a project's life. Thus, the primary benefit to low-income households seems to be moving families into newer housing, rather than into housing that is larger, subject to improved locational amenities and/or increased access to public goods, or less expensive. I argue this is a poor outcome if the primary goal of the program is effectively alleviating issues of housing affordability for poor families. Conversely, much of the literature discussed in Section II suggests that vouchers are a fairly efficient housing subsidy program, in the sense that transfers are made directly to lower income families without distorting their housing decisions on the margin.[17] Most notably, lower income families may be unlikely to pay a large premium for newer housing, instead focusing more on the units' size, structure, or location.

Conclusions and Policy Implications

This study extends previous investigations of the effects and efficiency of the LIHTC program by estimating the rent savings that accrues to low-income households over an

[17] Families pay 100% of the marginal cost of their housing choice unless the size of their individual voucher exceeds the magnitude of their rent.

LIHTC project's life-cycle. The presented analysis compares allowable rents for three selected subsidized complexes to predicted market rents that would otherwise be obtained for similar units. This exercise reveals that LIHTC project owners may only face binding price constraints for the first five to seven years after completion, a relatively short time period compared to the length of time LIHTC subsidized complexes commit to charging HUD defined affordable rents. I argue the results indicate the LIHTC program largely benefits project developers and owners, with a relatively smaller portion of benefits going to low income households in the form of rent savings. I contend this outcome compares unfavorably to the effects of voucher programs that have been documented in the literature. Future research should investigate whether similar results hold for LIHTC projects in other housing markets, particularly in large urban housing markets, where the area median income may be lower than the selected MSA and the number of LIHTC subsidized complexes may be larger.[18] Future attempts to model apartment rents should also further investigate the effect that property aging in various housing markets has on market rents, and the extent to which this dynamic distorts the intended benefits of federal project based subsidy programs, such as the LIHTC program.

[18] The mean income in the Tallahassee MSA is somewhat high when compared to larger urban areas in Florida. For example, Tallahassee's median income was almost $7,000 higher than for Tampa-St. Petersburg and $9,000 higher than Miami. Project owners may face different constraints in these housing markets.

REFERENCES

Baum-Snow, Nathaniel, and Justin Marion. 2007. *The Effects of Low Income Housing Developments on Neighborhoods*, Manuscript.

Burge, Gregory. 2007. *Modeling Apartment Rents: The Impact of Contractual Obligations, Neighborhood Quality, and Complex Age*, Manuscript.

Case, Karl. 1991. Investors, Developers, and Supply-Side Subsidies: How Much is Enough? *Housing Policy Debate* 2: 341-356.

Cummings, Jean, and Denise DiPasquale. 1999. The Low-Income Housing Tax Credit: An Analysis of the First Ten Years, *Housing Policy Debate* 10: 251-307.

Eriksen, Michael, and Stuart Rosenthal. 2007. *Crowd Out, Stigma, and the Effect of Place-Based Subsidized Rental Housing*, Manuscript.

Lancaster, Kelvin. 1966. A New Approach to Consumer Theory, *Journal of Political Economy* 74: 132-157.

Malpezzi, Stephen, and Kerry Vandell. 2002. Does the Low-Income Housing Tax Credit Increase the Supply of Housing? *Journal of Housing Economics* 11: 360-380.

McClure, Kirk. 1998. Housing Vouchers versus Housing Production: Assessing Long-Term Costs, *Housing Policy Debate* 9: 355-371.

McClure, Kirk. 2000. The Low-Income Housing Tax Credit as an Aid to Housing Finance: How Well has it Worked? *Housing Policy Debate* 11: 91-114.

Nelson, Kathryn. 1994. Whose Shortage of Affordable Housing, *Housing Policy Debate* 5: 401-442.

Newman, Sandra, and Ann Schnare. 1997. "…And a Suitable Living Environment": The Failure of Housing Programs to Deliver on Neighborhood Quality, *Housing Policy Debate* 8: 703-741.

Olsen, Edgar. 2000. *The Cost-Effectiveness of Alternative Methods of Delivering Housing Subsidies*, Working Paper, University of Virginia, Department of Economics.

Rosen, Sherwin. 1974. Hedonic Prices and Implicit Markets: Product Differentiation in Price Competition, *Journal of Political Economy* 82: 35-55.

Sinai, Todd, and Joel Waldfogel, 2005. Do Low-Income Housing Subsidies Increase the Occupied Housing Stock? *Journal of Public Economics* 89: 2137-2164. [Revised version of NBER w8709 (January 2002), "Do Low-Income Housing Subsidies Increase Housing Consumption?"]

Stegman, Michael. 1991. The Excessive Costs of Creative Finance: Growing Inefficiencies in the Production of Low-Income Housing, *Housing Policy Debate* 2: 357-373.

Table 1: Descriptive Statistics

Variable Description	Type	Mean full sample	St. Dev. full sample	Mean non-LIHTC	Mean LIHTC
Rent (monthly rent in dollars)	Cont.	643.1	241.2	643.1	-----
Log Rent (natural log of monthly rent)	Cont.	6.408	0.321	6.408	-----
Age of complex. (2002- Year Built)	Cont.	21.69	11.03	22.33	6.067
Age squared	Cont.	592.0	432.4	614.7	39.27
Individual occupant lease structure	Binary	0.100	0.300	0.104	0
Interior square footage of the unit	Cont.	952.4	299.3	950.6	997.6
Number of units in apartment complex	Cont.	156.9	90.55	155.22	198.5
Resident income requirement	Binary	0.089	0.285	0.093	0
Distance to city center (Straight line, in miles)	Cont.	2.599	1.092	2.551	3.762
Efficiency apartment (reference category)	Binary	0.026	0.160	0.027	0
One bedroom/ one bathroom unit	Binary	0.341	0.475	0.347	0.200
Two bedroom/ one bathroom unit	Binary	0.168	0.374	0.175	0
Two bedroom/ two bathroom unit	Binary	0.207	0.406	0.202	0.333
Three bedroom/ one bathroom unit	Binary	0.008	0.089	0.008	0
Three bedroom/ two bathroom unit	Binary	0.134	0.341	0.126	0.333
Three bedroom/ three bathroom unit	Binary	0.021	0.144	0.019	0.067
Four bedroom/ two bathroom unit	Binary	0.016	0.125	0.016	0
Four bedroom/ four bathroom unit	Binary	0.024	0.152	0.025	0
2 bedroom townhouse	Binary	0.031	0.175	0.033	0
3 bedroom townhouse	Binary	0.024	0.152	0.022	0.067
Extra half bathroom	Binary	0.047	0.212	0.049	0
Washer/dryer hook-up	Binary	0.640	0.481	0.626	1
Patio (or balcony if not on first floor)	Binary	0.756	0.430	0.776	0.267
Pool	Binary	0.850	0.357	0.844	1
Tennis court	Binary	0.163	0.370	0.169	0
Clubhouse	Binary	0.239	0.427	0.219	0.733
Crime cost measure	Cont.	116.3	146.4	118.4	65.12
Elementary school test score	Cont.	374.7	65.34	371.9	444.67
% black in census tract- 2000 census	Cont.	30.73	14.22	30.63	33.07
% renter in census tract- 2000 census	Cont.	64.48	21.20	64.8	56.67
Median household income- 2000 census	Cont.	29433	15208	29210	34860
LIHTC Complex	Binary	0.039	0.195	0	1

Table 2: OLS Regression Results

Model	Model 1	Model 2	Model 3	Model 4
Variable	Rent	Rent	log_rent	log_rent
age of complex	-12.289**	-12.294**	-0.154**	-0.161**
	(1.707)	(1.711)	(0.026)	(0.026)
age squared	0.173**	0.175**	0.019**	0.021**
	(0.038)	(0.039)	(0.006)	(0.006)
individual occupant lease structure	42.633*	49.779*	0.026	0.037
	(21.064)	(21.458)	(0.032)	(0.032)
interior square feet	0.094**	0.099**	0.021**	0.022**
	(0.030)	(0.030)	(0.005)	(0.005)
number of units in complex	0.185**	0.190**	0.025**	0.029**
	(0.057)	(0.058)	(0.009)	(0.009)
resident income requirement	-51.504**	-50.090**	-0.108**	-0.103**
	(14.087)	(14.079)	(0.022)	(0.021)
distance to city center	-11.893**	-12.354**	-0.020**	-0.018**
	(4.146)	(4.457)	(0.006)	(0.007)
one bedroom/ one bathroom	7.488	8.888	0.019	0.024
	(25.715)	(25.623)	(0.040)	(0.039)
two bedroom/ one bathroom	85.629**	87.449**	0.158**	0.164**
	(29.716)	(29.616)	(0.046)	(0.045)
two bedroom/ two bathroom	120.654**	123.160**	0.205**	0.211**
	(31.319)	(31.148)	(0.048)	(0.047)
three bedroom/ one bathroom	81.412	97.678	0.119	0.171*
	(54.065)	(54.807)	(0.083)	(0.083)
three bedroom/ two bathroom	228.050**	230.382**	0.332**	0.339**
	(36.873)	(36.708)	(0.057)	(0.055)
three bedroom/ three bathroom	437.420**	441.670**	0.512**	0.521**
	(45.536)	(45.313)	(0.070)	(0.068)
four bedroom/ two bathroom	613.023**	616.095**	0.674**	0.681**
	(47.269)	(47.440)	(0.073)	(0.072)
four bedroom/ four bathroom	803.930**	806.196**	0.743**	0.750**
	(52.246)	(51.886)	(0.080)	(0.078)
2 bedroom townhouse	133.739**	135.900**	0.217**	0.224**
	(39.552)	(39.469)	(0.061)	(0.059)
3 bedroom townhouse	245.340**	249.764**	0.352**	0.366**
	(44.871)	(44.818)	(0.069)	(0.068)
extra half bathroom	14.495	15.312	0.035	0.041
	(19.251)	(19.219)	(0.030)	(0.029)
washer/dryer hook-up	21.849*	12.516	0.058**	0.041*
	(10.286)	(10.815)	(0.016)	(0.016)
Patio	26.346*	27.925**	0.051**	0.057**
	(10.610)	(10.720)	(0.016)	(0.016)
Pool	19.360	19.379	0.056**	0.050*
	(12.934)	(13.896)	(0.020)	(0.021)
tennis court	0.345	-3.126	0.015	0.009
	(12.245)	(12.452)	(0.019)	(0.019)
Clubhouse	22.843	17.290	0.023	0.009
	(12.013)	(12.603)	(0.018)	(0.019)
crime cost measure		0.003		0.038
		(0.031)		(0.464)
school test score		-0.068		-0.016
		(0.090)		(0.013)
% black (census tract)		-0.359		-0.011*
		(0.359)		(0.005)
% renter (census tract)		0.353		0.018**
		(0.429)		(0.006)
median HH inc. (census tract)		0.001		0.029*
		(0.001)		(0.011)
Constant	547.983**	530.172**	6.154**	6.030**
	(37.781)	(62.228)	(0.058)	(0.094)
Observations	366	366	366	366
Adjusted R-squared	0.916	0.918	0.888	0.895

Standard errors in parentheses * significant at 5%; ** significant at 1%

Certain variables were rescaled before running (3) & (4).

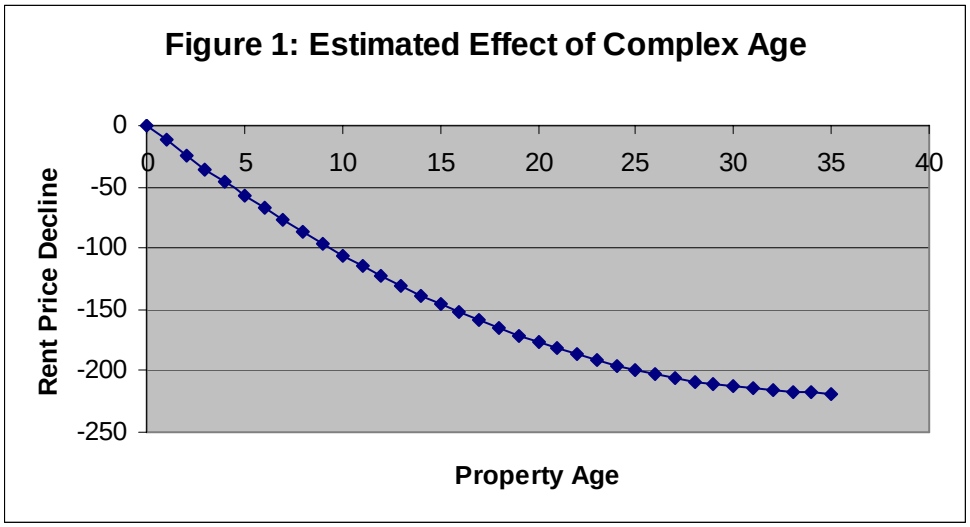
Figure 1: Estimated Effect of Complex Age
Rent Price Decline
0
-50
-100
-150
-200
-250
0
5
10
15
20
25
30
35
40
Property Age

Table 3: HUD Allowed & Predicted Market Rents, LIHTC Subsidized Units

Age (2002)	Unit Type	HUD Rent (2002)	Predicted Market Rent (2002)	Predicted Market Rent: New Unit (2002)
5	1 bed / 1 bath	644	613	670
5	2 bed / 2 bath	772	745	802
5	3 bed / 2 bath	892	861	919
5	1 bed / 1 bath	644	646	703
5	2 bed / 2 bath	772	779	837
5	3 bed / 2 bath	892	899	956
4	2 bed / 2 bath	772	762	808
4	3 bed / 2 bath	892	884	930
8	2 bed / 2 bath	772	748	835
8	3 bed / 2 bath	892	868	955
7	1 bed / 1 bath	644	602	680
7	2 bed / 2 bath	772	734	812
7	3 bed / 2 bath	892	860	938
7	3 bed / 2 bath	892	848	925
7	3 bed town.	892	874	952

Table 4: Example Calculation of Predicted Market Rents by Year

Year	Implied Age	2002 Predicted Rent (Varying Age)	Rental Housing Cost Index Multiplier	Adjusted Predicted Rent
2002	**8**	**748**	**1**	**748**
2001	**7**	**758**	**0.961**	**728**
2000	**6**	**768**	**0.925**	**711**
1999	**5**	**778**	**0.898**	**699**
1998	**4**	**789**	**0.875**	**690**
1997	**3**	**800**	**0.847**	**678**
1996	**2**	**811**	**0.823**	**668**
1995	**1**	**823**	**0.798**	**656**
1994	**0**	**835**	**0.772**	**645**